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LAPAROTOMY for the cure of tubercular peritonitis is an operation the usefulness of which was discovered by accident, and it is one of the benefits for which we have to thank the ovariotomist.

In the year 1862, Spencer Wells, the Nestor of abdominal surgery, operating for what he believed to be an ovarian tumor, opened an encysted peritoneal effusion, and found the walls of the cavity and the surrounding peritoneum thickly studded with tubercles. Recognizing his mistake, he closed the abdomen after thoroughly removing the fluid, and the patient not only recovered from the operation, but was speedily relieved of all symptoms and evidences of tuberculosis, and lived for more than twenty years afterwards. The significance of this success was not understood at the time, but gradually there accumulated a series of similar accidental cases scattered through the literature of ovariotomy which finally arrested the attention of abdominal surgeons, and seemed to show that peritoneal tuberculosis is often, if not usually, a local process which, if taken in time, may frequently be arrested by an incision into the abdomen.

Besides the array of patients that demonstrate this fact clinically, Hirschfeld has observed a case thus operated upon, which subsequently came to autopsy, and it was found that the tubercles had disappeared from the serous coat of the bowels where they had been seen to exist at the previous operation.

The following cases are reported as a contribution to the statistics of this operation, and the second of the two is interesting as being one of the first cases in which the diagnosis of tuberculosis was made before operation, and the incision was made in the hope of bringing the

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collapse when emptied, as its walls were everywhere attached to the surrounding parietes. The cavity was packed with iodoform gauze, and a tube was introduced into Douglas's pouch. Over this an antiseptic dressing was applied.

A considerable portion of the cyst wall which was removed was sent to Dr. W. W. Gannett for examination, and he found it filled with typical miliary tubercles.

The subsequent history of this case was that she promptly recovered from the operation, and slowly but surely gained health and strength. The interior of the sac suppurated, and for a long time the discharge was considerable. It slowly diminished, however, and on March 23, 1887 (six months after the operation), she left the hospital with still a discharging sinus, but otherwise in good condition. She went to friends in the Southern States, and was lost sight of.

CASE II. Clara T., three years old, entered the Children's Hospital July 25, 1887. There was no history of syphilis. Her mother died of phthisis when she was ten months old. A maternal aunt had also died of the same disease. The child was in the hospital in the winter of 1886 for debility from want of care since her mother's death, and was discharged well in six or eight weeks.

Six months before her second appearance at the hospital a diffused swelling of the abdomen was noticed, which increased slowly but steadily. Her bowels had been loose for about five months, and she had been troubled somewhat with otorrhœa and coryza. At the time of her entrance she was considerably emaciated.

Dr. H. C. Haven, in whose wards she then was, made a careful examination of the heart and lungs, with negative result. The urine showed nothing abnormal. The abdomen was much distended and very tense. It was dull upon percussion everywhere except over the highest point, where it was tympanitic. The cutaneous veins were not distended, and the liver was not appreciably enlarged. The circumference at the umbilicus was at this time twenty-three and one-half inches.

August 5th. I saw her with Dr. Haven, and coincided with his diagnosis of a probably tubercular peritonitis. We tapped her and withdrew three pints of greenish-yellow fluid, thereby reducing her girth to twenty-one and one-half inches.

The fluid slowly re-accumulated, and on September 21st her measured twenty-four and one-half inches. Dr. T. M. Rotch now tapped her again, and withdrew three and a half pints of greenish and ropy fluid.

This time the re-accumulation was even more rapid than before, and it seemed proper to resort to the more decided measure of an incision into the peritoneal cavity.

She was, therefore, transferred to my care, and on October 15th I opened the abdomen by an incision one inch and a half in length. The confirmation of the diagnosis was immediate and complete. Every portion of the peritoneum which could be reached was thickly studded with little round firm bodies projecting everywhere from its surface, and often hanging off with a slender pedicle. So abundant were these that the finger, when introduced into the abdomen, felt as if it were lying in a bag of small shot. The fluid, amounting to a little more than two quarts, was removed as thoroughly as possible, and a small bit of omentum with several tubercles attached was removed for examination. A little piece of rubber drainage-tube was introduced through the abdominal wall to provide for the escape of any fluid that might form in the next day or two, and the wound was closed about it. An antiseptic dressing was applied.

At the end of twenty-four hours it was found that no fluid was escaping through the tube, although a little leaked away around it. The tube was removed. Everything went well, and at the end of ten days the stitches were all removed, the wound being closed down to a granulating spot where the tube had lain.

November 3d (sixteen days after the operation), the child developed a sharp attack of bronchitis, which ran into broncho-pneumonia, and for a number of days she was dangerously ill, but slowly she got better, and in the course of the next month the lungs entirely cleared up, relieving us of the fear that tuberculosis might be developing itself there.

November 22d the wound broke down slightly, and presently discharged a small silk ligature, the one we had tied about the pedicle of the bit of omentum that was removed.

From this time the child steadily improved in flesh and strength, and regained the ruddy appearance of a healthy girl of her age. There was never any tendency to a return of the ascites, nor was there any hardness or tenderness to be detected in the abdomen.

The question as to how a simple incision into a peritoneal cavity filled with ascitic fluid, and studded with tubercles, works an arrest and apparent disappearance of the tubercular process is one of the hitherto unexplained enigmas of surgery. The observed facts are as yet too few to serve as the basis of any well-grounded theory on the subject.

Hirschfeld's observations show that the tubercles actually disappear from surfaces where they had been shown to exist, but we have not yet had the opportunity of sufficiently examining the conditions which accompany the cure of tubercular peritonitis.

In our endeavor to understand it, however, we should bear in mind certain characteristics of the tubercular process whch are well observed in other places. In local tuberculosis of the joints or bones we know that in certain cases the disease undergoes a spontaneous cure, or, at least, becomes quiescent, and does not again appear during the life of the individual. This process of retrogression is greatly favored by securing for the diseased part absolute rest and freedom from irritation, and by improving the nutrition of the patient through general measures, hygienic and medicinal.

When we get an opportunity to examine a joint which has suffered from tuberculosis and has recovered, we find the parts thickened and changed into fibrous tissue, with here and there cheesy or calcareous masses surrounded by a firm capsule. The process which has brought the tuberculosis to a standstill is analogous to that which we are familiar with around a cancerous growth. In each case the connective tissue about the morbid new growth is stimulated to increased activity, as is shown by the zone of new cells which surrounds both the tubercle and the cancer. These cells may finally develop into connective tissue fibres which surround and encapsulate the morbid new formation, and this fibrous tissue may finally, by its contraction, so press upon and interfere with the nutrition of the new growth as to lead to its death and disappearance by a process of fatty degeneration. This is the course of events so commonly observed in the scirrhous or hardening cancers, and also well illustrated in a tuberculous process developing in the midst of connective tissue.

It rarely happens that the vigorous growth of a cancer is definitely arrested by this effort of the surrounding tissues; for while it is held in check in one direction, it extends itself in many others, [illegible]

through the comparatively feeble barriers thus opposed to its progress. In tuberculosis, however, we have a process of much less vitality, and which, occurring in younger subjects, is often successfully hemmed in and destroyed by the healthy tissues about it.

Now, in the case of a tuberculosis of a serous membrane, the morbid growth takes place under somewhat different conditions, especially when an effusion has distended the cavity. Here the tubercles form upon a surface from which they project. They are in contact with the healthy tissues on but one side. On the other they are bathed in a serous fluid which favors rather than hinders their growth. They often become pedunculated, and hang off into the serum, almost detaching themselves from the membrane in which they originated. Under these circumstances it is easily seen that the tissues have but little chance to surround the tubercles by a zone of fibrous tissue, and so to bring about their destruction.

Turning now to a consideration of the conditions under which a cure has been brought about by surgical interference, we find reports of cases in which simple tapping and drawing off the fluid has been followed by an apparent arrest of the disease. These cases are, however, very exceptional, and leave us in some doubt as to the correctness of the diagnosis. The more radical procedure of making an opening into the abdomen and thoroughly evacuating the ascitic fluid has been followed by a very much greater degree of success.

Some operators have sprinkled the abdominal cavity with iodoform; others have washed it out with corrosive sublimate solution, or with simple water; others again have used carbolic acid in an antiseptic wash. All of these measures have been followed by about the same degree of success, and we are led to conclude that the special method of operating or of subsequent treatment of the wound or peritoneum is of no special importance, but that the one thing which is of importance is the thorough evacuation of the fluid, and it does not much matter how it is done, provided it is complete.

The difficulty of entirely removing an ascitic fluid through a canula seems sufficient to explain the rare occurrence of a cure after the imperfect evacuation of a simple tapping.

Dr. Van de Warker, in an interesting article in the *American Journal of Obstetrics* for September, 1887, points out two ways in which

the accumulation of ascitic fluid may, perhaps, act to intensify the morbid process: first, through its mechanical irritation by pressure, or by some unexplained irritating quality in its constituents; and, secondly, by acting as a medium for the propagation and distribution of the tubercle bacilli.

Granting the effect that the effusion may have in assisting the spread of the process in either or both of these ways, we can see how the removal of the fluid might somewhat hinder the extension of the disease, but we still have to explain the effect that removing the effusion has in causing an actual disappearance of tubercles already existing.

Upon this point Dr. Van de Warker says: "The irritated peritoneum is given a rest and allows of a process that belongs *per se* to tuberculosis, namely, the thickening and induration of the surfaces—an incapsulation—and which, Hegar suggests, may be a stage in spontaneous cure."

It seems to me that this suggestion of Hegar's is of the greatest interest, and that it is probable that the rest afforded to the peritoneum is of importance in allowing it to set up its process of induration, and so to resist the advance of the tubercles, but we may go a step farther and appreciate another effect of the removal of the effusion which must, I think, play a very great part in bringing about the disappearance of the tubercular process.

As has been said, the tubercles upon the peritoneum are free upon one side, and frequently even hang off from the surface so as to be almost detached from it. Now, under these circumstances, the tissues have no opportunity to surround them with a zone of young cells, which shall become fibres, and so shut them in, encapsulate and destroy them. This condition exists as long as the abdomen is filled with fluid and the peritoneal surfaces are separated.

When, however, the fluid is wholly removed, and the peritoneal surfaces fall together and acquire adhesions, the tubercles are then shut in between the coils of intestine, the omentum and the abdominal wall. They are thus surrounded by tissues in a high degree of activity, which can now throw around them the limiting zone of young cells, and eventually fibrous tissue, which, if the tubercular process is not too far advanced, may effectually resist it, and cause it to retrograde.

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In the year 1862, Spencer Wells, the Nestor of abdominal surgery, operating for what he believed to be an ovarian tumor, opened an encysted peritoneal effusion, and found the walls of the cavity and the surrounding peritoneum thickly studded with tubercles. Recognizing his mistake, he closed the abdomen after thoroughly removing the fluid, and the patient not only recovered from the operation, but was speedily relieved of all symptoms and evidences of tuberculosis, and lived for more than twenty years afterwards. The significance of this success was not understood at the time, but gradually there accumulated a series of similar accidental cases scattered through the literature of ovariotomy which finally arrested the attention of abdominal surgeons, and seemed to show that peritoneal tuberculosis is often, if not usually, a local process which, if taken in time, may frequently be arrested by an incision into the abdomen.

Besides the array of patients that demonstrate this fact clinically, Hirschfeld has observed a case thus operated upon, which subsequently came to autopsy, and it was found that the tubercles had disappeared from the serous coat of the bowels where they had been seen to exist at the previous operation.

The following cases are reported as a contribution to the statistics of this operation, and the second of the two is interesting as being one of the first cases in which the diagnosis of tuberculosis was made before operation, and the incision was made in the hope of bringing the

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tuberculous process to a standstill. This child was the youngest patient upon whom the operation has as yet been done.

Case I. Minnie B., colored, aged sixteen. Entered the Massachusetts General Hospital June 15, 1886. She was well as far as she knew till two weeks before entrance, when she noticed swelling of the legs. One week later the abdomen was perceptibly swollen, and she began to be troubled with dyspnœa. Examination of the heart showed a soft systolic souffle at the apex. The urine examination was negative.

June 16th. The patient complained of much pain in the upper part of the abdomen, shooting up into the chest. She was greatly prostrated. From this time the abdomen swelled rapidly, and soon became very tense.

June 21st (three weeks from the appearance of the first symptoms of ill-health), Dr. W. L. Richardson tapped her to relieve the distension, and drew off something over three quarts of dark yellow fluid. At this time the abdomen when emptied was felt to contain some ill-defined irregular lumps. After this tapping a circumscribed tumor slowly made its appearance in the middle line below the umbilicus.

September 8th. I saw her for the first time in consultation with Dr. F. C. Shattuck, and found a unilocular collection of fluid rising out of the pelvic cavity into the abdomen as high as the umbilicus. Vaginal examination showed the pelvis pretty well filled by a mass pressing down into the posterior cul-de-sac, in which fluctuation could not be well made out.

Dr. Shattuck, from previous examinations, had thought the case to be one of tubercular peritonitis, but the development of a single cystic tumor, and the absence of any hardening in any other part of the abdomen, made the appearance of things strongly suggest an ovarian cyst which had, in its early growth, been accompanied by ascites. I inclined to this view, and advised an exploratory operation.

The patient was transferred to my ward, and on September 17th, I operated with the usual incision midway between the pubes and umbilicus. It was found impossible to separate the peritoneum from the cyst wall, and an opening was made into the sac. The wall was fully three-quarters of an inch in thickness, and was found to be the greatly thickened peritoneum. A free opening was made, and three quarts of fluid and of a jelly-like material were removed. The cyst did not collapse when emptied, as its walls were everywhere attached to the surrounding parietes. The cavity was packed with iodoform gauze, and a tube was introduced into Douglas's pouch. Over this an antiseptic dressing was applied.

A considerable portion of the cyst wall which was removed was sent to Dr. W. W. Gannett for examination, and he found it filled with typical miliary tubercles.

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Hirschfeld's observations show that the tubercles actually disappear from surfaces where they had been shown to exist, but we have not yet had the opportunity of sufficiently examining the conditions which accompany the cure of tubercular peritonitis.

In our endeavor to understand it, however, we should bear in mind certain characteristics of the tubercular process whch are well observed in other places. In local tuberculosis of the joints or bones we know that in certain cases the disease undergoes a spontaneous cure, or, at least, becomes quiescent, and does not again appear during the life of the individual. This process of retrogression is greatly favored by securing for the diseased part absolute rest and freedom from irritation, and by improving the nutrition of the patient through general measures, hygienic and medicinal.

When we get an opportunity to examine a joint which has suffered from tuberculosis and has recovered, we find the parts thickened and changed into fibrous tissue, with here and there cheesy or calcareous masses surrounded by a firm capsule. The process which has brought the tuberculosis to a standstill is analogous to that which we are familiar with around a cancerous growth. In each case the connective tissue about the morbid new growth is stimulated to increased activity, as is shown by the zone of new cells which surrounds both the tubercle and the cancer. These cells may finally develop into connective tissue fibres which surround and encapsulate the morbid new formation, and this fibrous tissue may finally, by its contraction, so press upon and interfere with the nutrition of the new growth as to lead to its death and disappearance by a process of fatty degeneration. This is the course of events so commonly observed in the scirrhous or hardening cancers, and also well illustrated in a tuberculous process developing in the midst of connective tissue.

It rarely happens that the vigorous growth of a cancer is definitely arrested by this effort of the surrounding tissues; for while it is held in check in one direction, it extends itself in many others, and breaks

through the comparatively feeble barriers thus opposed to its progress. In tuberculosis, however, we have a process of much less vitality, and which, occurring in younger subjects, is often successfully hemmed in and destroyed by the healthy tissues about it.

Now, in the case of a tuberculosis of a serous membrane, the morbid growth takes place under somewhat different conditions, especially when an effusion has distended the cavity. Here the tubercles form upon a surface from which they project. They are in contact with the healthy tissues on but one side. On the other they are bathed in a serous fluid which favors rather than hinders their growth. They often become pedunculated, and hang off into the serum, almost detaching themselves from the membrane in which they originated. Under these circumstances it is easily seen that the tissues have but little chance to surround the tubercles by a zone of fibrous tissue, and so to bring about their destruction.

Turning now to a consideration of the conditions under which a cure has been brought about by surgical interference, we find reports of cases in which simple tapping and drawing off the fluid has been followed by an apparent arrest of the disease. These cases are, however, very exceptional, and leave us in some doubt as to the correctness of the diagnosis. The more radical procedure of making an opening into the abdomen and thoroughly evacuating the ascitic fluid has been followed by a very much greater degree of success.

Some operators have sprinkled the abdominal cavity with iodoform; others have washed it out with corrosive sublimate solution, or with simple water; others again have used carbolic acid in an antiseptic wash. All of these measures have been followed by about the same degree of success, and we are led to conclude that the special method of operating or of subsequent treatment of the wound or peritoneum is of no special importance, but that the one thing which is of importance is the thorough evacuation of the fluid, and it does not much matter how it is done, provided it is complete.

The difficulty of entirely removing an ascitic fluid through a canula seems sufficient to explain the rare occurrence of a cure after the imperfect evacuation of a simple tapping.

Dr. Van de Warker, in an interesting article in the *American Journal of Obstetrics* for September, 1887, points out two ways in which

the accumulation of ascitic fluid may, perhaps, act to intensify the morbid process: first, through its mechanical irritation by pressure, or by some unexplained irritating quality in its constituents; and, secondly, by acting as a medium for the propagation and distribution of the tubercle bacilli.

Granting the effect that the effusion may have in assisting the spread of the process in either or both of these ways, we can see how the removal of the fluid might somewhat hinder the extension of the disease, but we still have to explain the effect that removing the effusion has in causing an actual disappearance of tubercles already existing.

Upon this point Dr. Van de Warker says: "The irritated peritoneum is given a rest and allows of a process that belongs *per se* to tuberculosis, namely, the thickening and induration of the surfaces—an incapsulation—and which, Hegar suggests, may be a stage in spontaneous cure."

It seems to me that this suggestion of Hegar's is of the greatest interest, and that it is probable that the rest afforded to the peritoneum is of importance in allowing it to set up its process of induration, and so to resist the advance of the tubercles, but we may go a step farther and appreciate another effect of the removal of the effusion which must, I think, play a very great part in bringing about the disappearance of the tubercular process.

As has been said, the tubercles upon the peritoneum are free upon one side, and frequently even hang off from the surface so as to be almost detached from it. Now, under these circumstances, the tissues have no opportunity to surround them with a zone of young cells, which shall become fibres, and so shut them in, encapsulate and destroy them. This condition exists as long as the abdomen is filled with fluid and the peritoneal surfaces are separated.

When, however, the fluid is wholly removed, and the peritoneal surfaces fall together and acquire adhesions, the tubercles are then shut in between the coils of intestine, the omentum and the abdominal wall. They are thus surrounded by tissues in a high degree of activity, which can now throw around them the limiting zone of young cells, and eventually fibrous tissue, which, if the tubercular process is not too far advanced, may effectually resist it, and cause it to retrograde.

Lastly, in regard to the method of operating. As has been said, the simple evacuation of the fluid is all that we have to accomplish, and the wound may then be closed as after any laparotomy.

In both of my cases I used a drainage-tube, but I shall not do so again. According to reported observations, even so large and thick-walled a cavity as existed in my first case may be safely sewed up, with good hopes of arresting the tubercular process, and by discarding the drainage-tube we avoid the formation of a fistula with the long suppuration, which was a troublesome feature in this case.

TWO CASES OF LAPAROTOMY FOR PENETRATING WOUNDS OF THE ABDOMEN, WITH REMARKS.[1]

SINCE Dr. Bull's first case of pistol-shot wound of the intestines awakened interest in the treatment of these injuries, and in view of the constantly increasing list of patients successfully treated in the same manner, the duty of the surgeon to endeavor to repair intestinal injuries made by penetrating weapons or missiles has been almost universally accepted.

The following cases are presented as a contribution to the statistics of this class of injuries.

CASE 1. Stab wound of the abdomen: recovery.

Margaret K., who gave her age as about fifty, but who looked much older, entered the Massachusetts General Hospital August 18th, 1886. She was a spare, frail-looking woman. A little more than an hour before entrance she had been attacked by a man with a large pocket-knife. There was a long superficial cut on the right side of her neck, also a cut in the left labium. The abdominal injury was a punctured wound through the outer edge of the rectus muscle on the left side, about an inch below the level of the umbilicus. The patient was pale, as if she had lost considerable blood. She was not suffering much pain.

An immediate exploratory operation was undertaken to see whether the peritoneum was opened, and if so, whether any internal injury had been done. As it was found that the knife had entered the abdominal cavity, the opening was enlarged, enough to examine the viscera. One or two ounces of clotted blood lay in front of the intestines; this was sponged out, and a careful examination made of all the coils of intestine lying near the point of puncture. No wound of the intestinal wall was found, and there was no further bleeding as from wounded viscera; the incision was therefore closed. The patient recovered well from the ether, and was reasonably comfortable, with moderate abdominal pain.

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[1] Read at the meeting of the Surgical Section of the Suffolk District Medical Society, April 3, 1889.

August 21st (the third day). The dressing stained through, and on investigation it was found that the stitches, which were of paraffined silk, had slipped their knots, and a little mass of omentum about the size of a child's fist had protruded. Ether was given, and after returning the omentum to the abdominal cavity the wound was firmly sutured. From this time recovery was uninterrupted, and the patient left the hospital well in the early part of September.

In this case the anæmic, feeble condition of the patient gave rise to the fear that hæmorrhage was going on inside the abdomen. In the absence of much blood in the peritoneum it is probable that there had been a greater loss of blood from the external wounds than was thought at the time.

Case 2. Pistol-shot wound of the stomach: laparotomy and suture of the stomach wall; recovery.

Robert E., twenty-one years old, entered the Massachusetts General Hospital the evening of July 3rd, 1888.

Two hours previous to entrance, while standing beside a companion who was handling a revolver, he had been accidentally shot in the abdomen. The distance from the muzzle was about three feet. The ball, of 22 calibre, entered the body two inches above and one inch to the left of the umbilicus. The accident happened about an hour after he had taken a full supper. When seen he was suffering a moderate degree of pain about the wound, and this was increased somewhat by taking a long breath. On palpation there was some tenderness around and above the wound. He had not vomited nor felt any nausea. Laparotomy was advised and at once done.

A vertical incision three inches in length was made so that the bullet opening lay in the middle of it. The transverse colon at once presented in the wound, and was carefully examined for a considerable distance on either side; its mesentery was also inspected, but no wound found. The stomach was then drawn down into view, and at once the bullet hole was seen at about the middle of the anterior wall. The wound was a simple puncture, which did not gape, and through which there had been no escape of the stomach contents, even though the patient had vomited quite freely while going under the influence of ether. The hole was turned in, and closed by five interrupted Lembert sutures of fine silk.

The close condition of the wound in the anterior stomach wall, and the absence of extravasation of the stomach contents through it, made it seem wiser not to extensively separate the omental attachments of the organ in order to get at the posterior wall, This would have involved a much larger abdominal incision, and from the apparent line of the bullet it seemed likely that the wound of exit was close to the smaller curvature, where it would have been reached with difficulty, and at the expense of considerable violence of manipulation.

Further search was therefore not attempted, and the abdominal wound was closed.

The patient vomited much after the ether, but otherwise did well.

For three days he took nothing into his stomach but a little water; he then began to take milk and lime water cautiously, and gradually resumed ordinary food.

On the seventh day his bowels acted freely after a senna enema.

He was out of bed the fifteenth day, and went home at the end of eighteen days.

Since then he has been seen several times, and although he has suffered somewhat from debility, and has not regained fully the flesh that he had before his accident, yet the most careful and thorough examination fails to reveal local trouble anywhere either in the abdomen or chest.

Shortly before the occurrence of my second case Dr. Senn, who has done so much excellent experimental work in the abdominal cavity, suggested a new way of determining whether a penetrating wound of the abdomen opened the alimentary canal or not. This was by the injection into the rectum of hydrogen gas, which, if it escaped through the wound in the abdominal wall, could be ignited, and thus demonstrate beyond doubt the existence of an opening somewhere in the intestinal tube. He has shown, by experiment, that the hydrogen gas will thus make its way out; and I believe that until now it has escaped any admixture of oxygen which might form with it an explosive compound and make its ignition a dangerous matter.

Dr. Senn's experiments have shown that the gas finds its way upwards through the whole alimentary canal, and in one case he determined the existence of a perforation of the stomach by the escape of gas through a bullet wound in the lower part of the chest.[1]

Dr. Senn's other work in abdominal and other branches of surgery has been so full of practical suggestions, that a surgeon having a perforating wound of the abdomen, and neglecting to apply a test so highly praised by him, is open to the charge of a disregard of necessary precautions if he cannot show good reasons for his neglect. This must be my excuse for setting forth certain considerations which still deter me from the use of insufflation in these cases. Further experience may show the objections I shall state to be purely theoretical, but until this is demonstrated I shall prefer to treat wounds of the human abdominal cavity in a less experimental way.

Hesitation to use insufflation for the perfection of diagnosis may arise from two fears: one, that it may sometimes fail as a means of testing the condition of the intestines, whether injured or not; and the other, that it may introduce additional dangers into the case.

That it is possible in most cases to demonstrate the existence of a perforation of the intestine in this way has been abundantly shown. Whether the injection of hydrogen furnishes an infallible test may well be doubted. The abdominal wall being made up of separate layers of muscles and other tissues, which shift upon each other with every movement of the body, it must now and then happen that the opening through it is tightly closed, and will not permit the passage outward of gas that has escaped among the intestines. Errors from this cause may generally be avoided by the introduction through the wound of a pair of dressing forceps, a director, or a tube; but with a thick, fat, abdominal wall these measures may fail, especially if the omentum plugs the wound on the inside.

Again, suppose a bullet perforates a coil of intestine that is full of liquid fæces. It is evident that the gas cannot escape through until it has pushed the liquid out before it.

If it is acknowledged that the gas will sometimes not escape even though the intestine is injured, what guidance does the surgeon get from its use in deciding the question whether in a given case to explore the abdomen? In the cases in which the hydrogen gas test succeeds in demonstrating a perforation, we shall certainly do laparotomy.

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[1] In this case the injection was made directly into the stomach.

But what are we to do in the cases in which it does not succeed? Are we then justified in not doing an exploratory operation?

This is the question which the surgeon has to meet; and until it is shown that the fear that in a certain proportion of cases of perforation the test will fail is groundless, he must either do a laparotomy, even in the cases in which hydrogen gas does not issue through the external wound, or he must expect to leave some cases of perforation not operated upon.

Furthermore, it should be remembered that perforation of the intestine is not the only injury wrought by penetrating wounds, which it is the surgeon's duty to rectify. Serious lacerations of the mesenteric or other vessels may exist even without a perforation of the intestine. In both of the cases of intestinal suture reported by Dr. Senn, in the Philadelphia *Medical News* of November 10th, 1888, there was profuse bleeding from the mesenteric veins, and the ligation of these was one of the important benefits of the operation.

It is the strong chance of such accidents as this, and the feeling that there will be cases in which perforations of the intestines or stomach will escape the hydrogen gas test, that make the writer feel that in the cases where no hydrogen emerges from the outer wound the surgeon would still not be justified in foregoing an exploratory operation.

If this feeling is borne out by facts, and an exploration is called for whether the hydrogen test succeeds or not, it is obviously a waste of time to apply the test, even supposing the injection of the gas to be a harmless proceeding. But is this last supposition correct?

Dr. Senn says that the gas is aseptic and therefore innocuous. Does he mean by this that the gas, after passing through many feet of intestine, enters the peritoneal cavity in an aseptic condition? And what is to be said of the intestinal contents that the gas drives along with it? They are certainly not aseptic, and it is therefore evident that there is a strong possibility that the injection of gas may add to the dangers of a given case, and should not be lightly used.

What has been said up to this point applies only to the use of the gas for diagnostic purposes before an incision has been made.

There is another use of gaseous insufflation to which Dr. Senn calls attention in the paper already referred to, which may be of great service.

After closing all of the perforations that he could find, he again injected the hydrogen into the rectum and it at once began to bubble up from the pelvis. Following down the sigmoid flexure, and compressing it at different points, the gas still escaped until he reached the rectum, where he found and closed a last wound.

Continuing the injection, he saw the gas go up past the openings that he had closed, and finally, stopping the injection to avoid the too great distention of the bowels, he pressed the gas already introduced upwards from coil to coil until he reached the duodenum and stomach, without finding any more perforations.

This application of the insufflation, after all of the openings that can be readily found have been closed, seems to be of undoubted value. It enables the surgeon to make a quick but thorough exploration of the bowels with the least possible amount of handling. The gas escapes at once into the air, and does not carry impurities throughout the abdominal cavity, and if it carries with it liquid fæces their escape is at once perceived and they are quickly removed by irrigation.

For this exploration it would seem that air would be equally good with hydrogen gas.

The suggestion of this procedure adds one more to the capital points in abdominal surgery for which we are indebted to Dr. Senn.

To return now to the consideration of the cases reported. In both of them laparotomy was performed at once when they were first seen.

This practice of immediate laparotomy, without waiting for convincing symptoms of serious intra-abdominal lesion, seemed wise, for the following reasons:

First: It was felt that the enlargement of the penetrating wound through the abdominal wall added little or nothing to the severity of the injury, and would give the opportunity to discover and repair any lesion of the intestines or other abdominal contents before the occurrence of peritoneal inflammation. The absence of danger in a simple incision into the abdomen is generally recognized.

Secondly: We know that symptoms are often very poor guides to an appreciation of the severity of intra-peritoneal injuries, and if we wait until the patient's condition demands an operation, we shall often find that a serious inflammatory condition has arisen, which we are powerless to stop, even though we may succeed in closing the intestinal wound that gave rise to it.

Thirdly: In the event of any considerable vessel being injured it is, of course, important to stop the bleeding early before the patient is seriously exhausted. Here again, if we wait until the symptoms of internal hæmorrhage are unmistakable, we shall run a serious risk of letting the patient slip into a condition from which he cannot be recovered.

In view of these considerations it seemed to the writer, and he still thinks it a good rule in practice, that—in a case of penetrating wound of the abdomen, made by a sharp weapon or by gun-shot—the wound should be followed carefully down until the operator is convinced that it enters the abdominal cavity. When this is established the peritoneum should be opened with enough freedom to allow of a sufficient inspection of the abdominal contents, and for the repair of any injury found.

It seems probable that by this immediate operation cases will be saved which would be lost if time were given for the peritoneum to inflame or for serious loss of blood to occur; whereas with proper care in making a clean, aseptic operation the surgeon will rarely, if ever, feel that he has added to his patient's risk by the exploration.

NOTES ON COMPLICATIONS MET WITH IN CASES OF STRANGULATED HERNIA.

It is the object of this paper to present an account of some of the complications met by the writer in the operation of herniotomy.

Some of these complicating circumstances have merely a scientific interest, while others introducing special danger, required operative measures for their relief, and demand therefore the consideration of surgeons.

HYDROCELE OF THE HERNIAL SAC.

J. L., a very stout laboring man of about forty, entered the Massachusetts General Hospital, December 23, 1885. He gave an indefinite history of an enlargement, as he supposed, of the left testicle coming on slowly in the past five years. He did not pay much attention to it till one month before entrance, when it began to be inconveniently large. One week ago, after a blow on the scrotum from the handle of a switch, it increased rapidly in size, and caused a severe dragging pain along the cord and up into the groin.

At entrance he had a tense elastic swelling somewhat larger than two fists, filling the left side of the scrotum, and extending up into the inguinal canal. The penis was almost wholly concealed. The tumor was not translucent.

An aspirating needle was introduced, and between one and two pints of reddish fluid were withdrawn. This only reduced the tumor about one-third, leaving still an elastic, but not tense, swelling extending from the bottom of the scrotum up into the inguinal ring. The fluid rapidly re-accumulated in the sac, and in about a fortnight the patient was etherized and an incision was made into the scrotum. A good quantity of bloody serum like that withdrawn by the aspirating needle was evacuated, and then the mass filling the scrotum behind was seen to be an omental hernia much altered in its appearance by œdema, and studded here and there with spots of ecchymosis. The omentum was tied with silk at the constricted part in the neck of the sac, and then cut off, the pedicle being returned to the abdomen. The ring was brought together as well as possible with sutures, a drainage tube was introduced into the old hernial sac, and the wound was closed around it.

Convalescence was slow, and was retarded by an abscess in the scrotum, but the wound finally healed solidly.

The condition which was found in this case is a rare one. Dr. Mc Ardle and Dr. Kolpinski, in a recent paper,[1] have been able to find but twenty-nine authenticated cases of hydrocele of the hernial sac. They find that the accumulation of fluid may take place in a sac which at the time has no abdominal contents, but that the more common condition is an irreducible epiplocele with adhesions about the neck of the sac. Occasionally, a small knuckle of intestine may partly protrude. Usually, the antecedent history of hernia makes the diagnosis tolerably clear. In our case the extremely meagre history which the closest questioning could not amplify, left us in doubt as to the nature of the previous swelling; and the recent injury with the bloody fluid led us to think strongly of an hæmatocele in an old hydrocele sac.

FEMORAL HERNIA WITH A DOUBLE SAC.

This patient is also interesting for having undergone two herniotomies within four months.

On March 24th, 1887, Kate L., aged thirty-four, entered the Massachusetts General Hospital with a strangulated hernia at the left femoral ring.

She was operated upon by Dr. John Homans. Upon cutting down upon the hernia he opened a sac containing about two ounces of serum. During incision of the constriction a second sac lying against and covering the ring was punctured, and through the opening a probe passed into the abdominal cavity through the ring. This inner sac was pushed into the abdomen, and the ring was closed with catgut sutures.

Convalescence was somewhat retarded by an attack of erysipelas, but she was discharged well in less than a month.

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[1] Philadelphia Medical News, Jan. 9, 1886.

On July 25th, 1887, she again entered the hospital with a strangulated hernia at the same ring as before. She had worn a spica bandage for two months after leaving the hospital, but then discontinued it. One week ago she again noticed a bunch in the groin, and twelve hours before entrance, while stooping to pick up something, she felt a "giving way" in that side. She soon began to suffer from abdominal pain and to vomit.

The tumor was about the size of a hen's egg. She was etherized, and gentle taxis proving unavailing, herniotomy was done. The dissection down to the sac was somewhat obscured by the cicatrix and adhesions following the previous operation. A sac containing about two ounces of serum was opened, and at the bottom of it was a bulging mulberry-colored mass, adherent around the ring. At first this was thought to be an adherent coil of intestine, but it was presently shown to be a second sac. This was now opened, and at the bottom of it was a little strangulated bit of intestine no larger than the end of the thumb. The constriction was divided, and this was returned to the abdomen. The neck of the inner sac was pulled down and tied, and also stitched to the sides of the ring. The outer sac was stitched together with the skin.

The recovery was uninterrupted. The bowels relieved themselves of flatus about twelve hours after operation, and the patient went home on the seventeenth day.

INGUINAL HERNIA WITH HOUR-GLASS SAC.

J. M., aged twenty-nine, entered the hospital July 21, 1887. He had ruptured himself on the right side while riding two-and-a-half years before. The hernia was reduced by taxis, and a truss was worn. Three months ago the hernia came down again, and after a few days was reduced by recumbency and the application of ice.

Two days before entrance he carried a heavy valise some distance. The next day he felt some pain in the right iliac region, and vomited twice that evening. When seen at the hospital the right side of his scrotum was occupied by a soft elastic swelling as large as an orange. Over the inguinal ring and separated from the scrotum swelling by a well-defined constriction, was a hard, slightly elastic mass about the size of a hen's egg. This was very sensitive to pressure. The patient was etherized, and taxis was tried without success. An incision was then made over the upper inguinal swelling. The sac was opened and found to contain a little knuckle of intestine close to the ring, with a mass of omentum behind and below it. This omentum was connected by a narrow band with a larger mass below in the scrotum. The constriction of the sac between these two parts was so narrow that it had to be incised before the hernial contents of the scrotum could be drawn out and passed on into the abdominal cavity.

This constriction may have represented the neck of the original sac, and when the second protrusion took place it pushed the whole of the old hernia before it and formed a new sac for itself.

Van Buren gives a different explanation. After describing a similar condition, he says:

"The constriction at the middle of the sac, which formed so prominent a feature in this case, giving it the shape of an hour-glass, seemed to me to mark the point where nature had attempted, unsuccessfully, to obliterate the communication between the tunica vaginalis proper and the tubular prolongation connecting it with the peritoneal cavity. ..... I suspect from frequent examination of the parts in the dead body, that the process of peritoneum connecting its cavity with the tunica vaginalis testis remains unobliterated more frequently than is generally supposed, and that the effort at obliteration is more marked at the internal ring and just above the testis, and that this circumstance explains the frequency of stricture at the internal ring, as well as the constriction observed at or below the middle of the sac."

The next three cases I propose to consider together, as they all illustrate and emphasize what I believe should be a rule of practice, and which I would state as follows: When, after the reduction of a hernia either by taxis or by herniotomy, the symptoms of the strangulation or of great peritoneal irritation continue, when the patient is not soon relieved of the vomiting, pain, and tympanites, a further exploration should be made. The wound should be re-opened, and if a sufficient explanation of the symptoms is not found there, the incision should be continued upward, the abdomen should be opened, and a search should be made for the condition which is causing the trouble.

INTERNAL STRANGULATION FOLLOWING THE REDUCTION OF AN OLD INGUINAL HERNIA.

Fanny R., aged forty-eight, had long had an inguinal hernia of the left side, which gave but little trouble, being easily reduced. On January 12, 1885, the hernia came down about the size of a goose's egg, and as it did not go back readily, Dr. H. E. Marion, of Brighton, was summoned, and easily reduced it. The patient, who was of intemperate habits, was drunk at the time he saw her.

She continued to have pain in the abdomen, and two days later began to vomit. The bowels remained constipated. Dr. Marion saw her again, and on January 17th he succeeded in getting her to enter the hospital. She was at this time very feeble. The abdomen was now considerably distended and tympanitic. The old hernial sac was empty, and was drawn in towards the ring.

With the concurrence of Dr. John Homans, it was decided to do laparotomy. The abdomen was opened in the median line below the umbilicus. Immediately, a number of coils of sloughing, black intestine were brought to view. About three feet of small intestine was thus gangrenous. A search was made down along the sloughing bowel for a twist or a band that would account for the strangulation. On account of the softened condition of the gangrenous coils, the greatest gentleness was observed in the manipulations, and the distended condition of the rest of the intestines made this search very difficult.

At last, what was thought to be a soft band around a portion of the intestines was found and separated with the fingers. The gangrenous portion was then drawn out as far as possible on the front of the abdomen and secured to the skin; it was then opened.

This operation, which was done as quickly as possible, on account of the collapsed condition of the patient, was not followed by any relief, and death ensued twelve hours later.

No thorough autopsy was allowed, but I opened up the abdominal wound, and after puncturing and collapsing a number of coils of intestine, I was able to follow the gangrenous portion down to where it was constricted by a narrow, firm band, which stretched from the bottom of the old hernial sac across to the mesentery of a neighboring intestine. This band was evidently an old adhesion which had once formed between the mesentery and the sac, and which had gradually become stretched and thickened into a firm fibrous band.

The course of events in the production of the strangulation which caused death was as follows:

The intestine came down on one side of this band and entered the old hernial sac. When reduced, it went up into the abdomen on the other side of the band. This left a small coil of intestine looped down beneath this band. The peristalsis of the bowel gradually pulled more and more through, until so much had passed through this opening as to fill it up and cause a constriction which led to the death of all of the intestine beyond.

FEMORAL HERNIA, HERNIOTOMY; INTESTINE DISPLACED FROM AN EXTERNAL SAC INTO AN INTERNAL ONE, IN WHICH IT REMAINED STRANGULATED.

Charles R. D., aged sixty-seven, had had a right femoral hernia for a number of years. It usually went back at night. On the night of December 9, 1885, it did not go up, and on the following day he had great abdominal pain, with nausea and vomiting. The patient dosed himself liberally with cathartics without result, and finally, towards evening, he sent for his physician, Dr. C. V. Bemis, who, finding taxis unavailing, sent him to the hospital.

I saw him at ten o'clock that evening. The hernial tumor was about the size of an orange, and situated over the femoral ring. The patient was feeble, with a weak pulse. Ether was given, and after a short attempt with taxis, herniotomy was done. The sac was opened, and found to contain a dark, plum-colored knuckle of intestine, another bit of bowel not discolored, and a piece of omentum.

The neck of the sac was incised, but still the hernia did not go back. With the finger inside of the peritoneum, another more extensive incision was made, and then the hernial contents were returned with some difficulty. Deep stitches were taken in the neck of the sac, and superficial ones in the skin.

December 11th. The patient had comparative comfort for the rest of the night, but in the morning had considerable pain at the umbilicus.

The temperature was below 99 degrees F., and the pulse between 80 and 90.

December 12th. Still some pain, easily controlled by morphia. Vomited once or twice. Temperature 98 degrees F.; in the morning, 99 degrees F.; in the evening, pulse 90.

December 13th. Severe attack of pain in the early morning relieved by one-fifth grain of morphia. At the time of my visit, in the middle of the day, the pulse, which had risen from 90 on the previous day to 120, was almost imperceptible, and he died at two o'clock.

At the autopsy, made by Professor Fitz, a loop of intestine was found in a grangrenous condition close down to the inside of the femoral ring. It was contained in a sac composed of peritoneum.

The accompanying illustrations after Bryant, show in diagram the various ways in which a strangulation may occur in this region after the apparent reduction of a hernia.

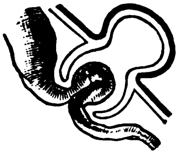

Fig. 1.

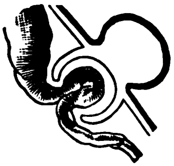

Fig. 2.

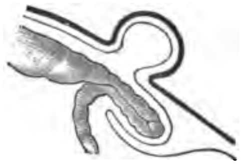

Fig. 3.

No. 1 represents the condition when a hernia is reduced "en masse" or "en bloc"; that is, when the whole sac, with the strangulation unrelieved, is pushed back into the abdomen. This was not the condition in our case, for the bowel was distinctly put back out of the sac.

Either of the other two illustrations may represent the condition that we had.

No. 2 shows a herniated loop of intestine pushed back out of the external pouch, but still strangulated in the neck of the sac.

A consideration of the case of hour-glass contraction of the sac reported above will give an idea of how this condition of things might be brought about; for if the hernial contents were displaced from the lower sac into the upper one, and if this upper division of the sac were at the time within the abdominal wall, how easily the condition might be overlooked and left uncorrected.

The third figure represents a sac with a diverticulum just within the abdominal wall, into which the hernial contents might find their way, when reduced, out of the external sac. To which of these last two conditions our case corresponded, it is impossible to say.

This case is, further, a good example of the deceptive character of the symptoms in intestinal strangulation. On the first two days after operation, we had no more disturbance than might result from a moderate peritonitis about the herniated loop of intestine, so that although the question of internal strangulation was considered, in view of the persistent constipation, still it was not deemed wise to interfere by operation. When the symptoms of danger did come, the fatal issue followed so closely upon them that no opportunity for interference was given.

GANGRENE OF HERNIAL SAC AFTER HERNIOTOMY; LAPAROTOMY; RECOVERY.

Pera S., a small, thin woman, giving her age as forty-five, but looking much older, entered the Massachusetts General Hospital, October 26, 1887. The history was, briefly, that a lump had been noticed in the right groin for three years. Since first seen it had never disappeared. Three days before entrance she began to have great pain in the abdomen, especially in the right iliac region, and the bowels ceased to move. For one day she had been vomiting.

The tumor was about the size of a hen's egg, and was tender to the touch. It lay above Poupart's ligament. She was etherized, and, after an ineffectual attempt at reduction by taxis, herniotomy was done.

The sac contained no fluid. The protrusion consisted of a small knuckle of intestine and a little bunch of omentum, and had come out through the inguinal ring. The constriction was incised, and the hernial contents were returned to the abdominal cavity. The sac was turned in, and the pillars of the ring were stitched in front of it.

October 27th [the next day]. The patient was very uncomfortable, and was still vomiting. There was diffused tenderness over the whole abdomen, but the pain principally complained of, was in the right iliac region. She had, in the morning, a small involuntary dejection, and another slight one after a turpentine enema. Towards evening, she was failing rapidly. She was still vomiting, and the pulse, which had been rapid from the first, became very weak and intermittent. Another enema was given without effect.

It being evident that some serious condition still existed in the neighborhood of the hernia, and there being some hope that it might be remedied by an operation, laparotomy was advised, and was accepted by the friends.

Ether was given and the wound was re-opened, and was then prolonged by an incision parallel to and just outside of the linea semilunaris, opening the peritoneal cavity. The intestines were gently pushed away from the neighborhood of the inguinal ring. They were perfectly free, no part of them being engaged in any ring or sac, and no portion that was seen being discolored, as if recently strangulated.

Upon investigating the hernial sac, which had been turned back into the abdominal cavity, it was found somewhat discolored, and had the appearance of commencing gangrene. It was, therefore, drawn down out of the abdomen, and the peritoneum was closed behind it.

October 28th [the following day]. The patient was free from the intense pain from which she had previously suffered, and said that she felt much better. She was able to bear a small amount of liquid food.

She continued to hold her own through the next two days, and on October 31st she had several small, loose discharges from the bowels.

November 1st. The bowels again acted freely.

November 3d. The sloughs from the old sac came away. From this time there was slow, but steady improvement, and the wound finally closed.

November 19th. She was taken home by her friends. Some weeks later she was heard from, and had then resumed her household work.

In this case, the dangerous symptoms were evidently due to the commencing peritonitis about the sloughing hernial sac, and the improvement following the laparotomy, by which the gangrenous portion was brought outside of the peritoneum, was immediate. I have not been able to find another instance of just this condition of things. Perhaps it is sometimes an unsuspected cause of death after hernia.

Besides the cases of immediate trouble following herniotomy or reduction by taxis, we have at times conditions leading to obstruction of the bowels a considerable time after the reduction of the hernia.

A case of umbilical hernia operated on by me, and reported some years since, illustrated this condition of things:

The patient, a woman of forty-seven, bore the operation well, her bowels acted naturally in due time, and the wound healed by first intention. On the ninth day she took a little solid food for the first time, and this change from a liquid diet was followed by considerable pain in the abdomen, referred to the neighborhood of the umbilicus, and colicky in character. A little hardness and fulness was to be felt just to the right of and above the umbilical region, and this part was tender to pressure. The bowels being somewhat constipated, several small doses of castor oil were given, with the effect of producing a free, easy dejection, and of relieving the pain.

Several times during her subsequent stay in the Hospital the same course of events was noticed; namely, that when her bowels were constipated she suffered from cramps, with occasional vomiting, and that these symptoms were relieved by a mild cathartic.

It was believed at this time that the bowels were somewhat obstructed, probably owing to adhesions about the loop of intestine that had been returned while inflamed, and had set up a local peritonitis in its neighborhood.

Treves, in an interesting article on the "Forms of Intestinal Obstruction that may Follow after Hernia," enumerates the following conditions that may give rise to intestinal obstruction some time after the reduction of a hernia, either by taxis or by herniotomy:

1. Organic stricture of the bowel, as a result of hernia.
2. The herniated loop, after reduction, becomes fixed to the abdominal parietes by adhesions.
3. The two ends of the herniated loop may be fixed together by adhesions.
4. The adhesions between the reduced loop and the parietes may develop into a band, behind which, subsequently, strangulation may occur.
5. To the inflamed peritoneum about the hernial orifice a part of the omentum may become adherent, and lead to subsequent internal strangulation.

The case I have just narrated probably is to be placed in the second or third of these classes, for the first symptoms followed so soon upon the operation that a stricture or a band would have hardly had time to form.

The prompt relief that always followed laxatives deterred us from operative interference at that time, and led us to hope that in time the condition might correct itself.

The patient, when she left the Hospital, was especially warned of the danger, and I asked her to let me know at once if she ever had an attack of abdominal pain which did not yield to laxatives. It was, therefore, a great disappointment to hear later that she died of just such an attack, which her attending physician treated with opiates, and without laxatives.

RUPTURE OF THE INTESTINE DURING THE REDUCTION OF A HERNIA.

PATRICK H., aged about sixty, entered the Massachusetts General Hospital with the following history.

The patient had suffered many years with a right femoral hernia which he had always been able to reduce himself. Two days before entrance at the hospital the hernia came down, and his efforts to reduce it that day were unavailing. During that night he had a good deal of pain, and the following day, after several unsuccessful and rather violent attempts, he finally succeeded in returning the hernia to the abdomen. He was at once seized with abdominal pain, much more severe than what he had felt previously, and this persisted up to the time of entrance.

When he arrived at the hospital, twenty-four hours after the reduction of the hernia, he was in a much collapsed condition, with pinched, gray face, and anxious expression. He had no severe vomiting, but occasionally gulped up a little bitter fluid. He was suffering much general pain through the abdomen, which was considerably distended, tympanitic, and universally sensitive to pressure. His pulse was rapid, irregular, and thready, and his respirations were forty in a minute. There was no tumor at the site of the old hernia.

The diagnosis made, was of rupture of the intestine during efforts at reduction, and a consequent general peritonitis. Laparotomy was advised as a last attempt to save his life. This was agreed to and at once carried out.

The incision was made directly upwards from over the sac on to the abdominal wall. The sac was found empty, and the peritoneum was quickly opened. At once there was an escape of much fluid, containing great clumps and masses of purulent fibrin, but having no fecal or unpleasant odor.

The patient did not bear the ether well, and although but a few minutes had been occupied, he was becoming rapidly more and more collapsed.

Under these circumstances it was thought unwise to prolong the operation by hunting for a perforation, which, from the absence of fecal constituents or odor in the effused fluid, was presumably small.

The abdomen was irrigated with hot water, which washed up several handfuls of clotted and purulent fibrin from the pelvic cavity. A large drainage tube was introduced to the bottom of the pelvis, and the wound was closed.

In spite of every effort to overcome the condition of collapse, the patient did not rally, and died about three hours after the operation.

A partial autopsy was allowed. After a long search a minute perforation was found in a little congested coil of small intestine which lay at the bottom of the pelvis. The purple color of this bit of intestine showed that it was the part which had lain in the hernial sac. The drainage tube lay so close to the opening that it might have been expected to have furnished a sufficient outlet for any intestinal contents subsequently escaping, had the patient rallied from the collapsed state into which he had fallen.

This case is a good illustration of the rapidity with which a fatal issue may follow peritoneal injury and inflammation. The intestinal lesion was of a kind that could have probably been remedied, had the operation been reached at a time when the patient still retained a fair degree of strength. The result shows that in these cases a delay even of a few hours may change a remediable condition into a fatal one.

This patient is also an example of the bad effects of violent and ill-advised efforts at taxis even in a reducible hernia.

UNDESCENDED TESTICLE WITH LEFT INGUINAL HERNIA; REDUCTION EN BLOC; LAPAROTOMY; RECOVERY.

Charles R., aged twenty-seven, entered the Massachusetts General Hospital July 17th, 1888, with the following history:

The patient had always had an undescended testicle on the left side, the organ having been arrested in its descent just outside of the inguinal ring in the groin. For many years he had also had a hernial protrusion through the same ring, and this had troubled him several times by being for a time irreducible.

On July 14th [three days before entrance] the hernia was down and caused discomfort. It did not go back easily, and was finally reduced with some difficulty under ether.

When he recovered from etherization, it was found, however, that his symptoms were rather aggravated than relieved. He still had abdominal pain, especially in the left side; and the vomiting continued persistently and presently became fecal in character.

When he entered the hospital there was nothing to be felt in the abdomen or in the inguinal region, and the left testicle could not be found.

The continuance of symptoms of strangulation made it clear that constriction of the bowels still existed somewhere, and a laparotomy was advised.

This being agreed to, an incision was made from over the sac of the hernia, upwards on to the abdomen. On laying open the sac it was found empty, but following it up through the inguinal ring, a dilatation of the upper part of the sac was found inside the abdominal wall; and this contained a purple loop of intestine.

The neck between the upper part of this hour-glass-shaped sac and the peritoneal cavity was formed by a thick band of fibrous tissue which represented the true neck of the sac, and which would easily admit the end of the finger. It would have been amply large to allow of the return of the hernia, had it not been blocked by the testicle, which lay across the opening, and closed it as by a valve.

The more the intestine was pressed up from below, the more closely did it force the testicle into the ring and close it. On relaxing the parts and pulling down upon the sac so as to draw the testicle away from the orifice, the bowel slipped up quite easily.

A further examination was made of the contents of the abdomen to make sure that no other constriction or injury of the intestine existed, but nothing was found.

In closing the wound, the neck of the sac was drawn together by encircling stitches for a distance of an inch and a half to two inches, and care was taken that the uppermost stitches should be well within the abdomen, so that no depression should be left on the peritoneal side of the ring.

The patient was entirely relieved of his symptoms, and made a rapid and good recovery, leaving the hospital well on August 8th, twenty-two days from the time of entrance.

This man was heard from in February, 1889 [six months after the operation], and he then wrote that although he had worn no truss, there had been no return of the hernia. He says in this letter, "I sometimes feel a smarting, burning feeling if I work very hard, or lift anything very heavy; this is all."

In this case we had a rather rare complication of hernia, and a good example of the difficulty that an undescended testis may cause. It adds one to the many cases illustrative of the importance of a prompt laparotomy when symptoms of strangulation persist after the seemingly complete reduction of a hernia.

One point noticed in this last case may be of practical importance in guiding us to the proper application of taxis under similar conditions.

As has been described, the testicle lay against the opening through the neck of the sac, and closed it as by a ball valve. The more the pressure from below, the more complete was this closure of the ring, so that the effort to push the bowel up made the obstacle even greater. When, on the other hand, the part of the sac which lay in the scrotum was pulled downwards it drew the testicle, which was attached to the wall of the sac, away from the opening, and the bowel easily slipped up by it.

In a similar case, during taxis, it is quite probable that by pulling forcibly down on the scrotum the testis might be held away from the ring, and the return of the hernia thus be rendered possible.

From what was seen in this case, it seems a proper rule that, in a hernia complicated by a testicle retained in the region of the inguinal canal, if strangulation occurs, every effort should be made to draw down the testis by pulling on the lower part of the tunica vaginalis. And after the hernia has been restored to the abdominal cavity, the reduction shall not be considered complete until the testicle has again, by traction on the scrotum, been drawn down to its old resting-place, where it can be distinctly felt. In this way the danger of a reduction en bloc with the testis still occluding the neck of the sac will be made less probable, if not wholly avoided.

TWO CASES OF ABSCESS OF THE LIVER IMPLICATING THE PLEURAL CAVITY: OPERATION WITH RECOVERY.[1]

THE occurrence of abscess of the liver in this vicinity is sufficiently rare to lend an interest to the two cases that I have to report. Both were examples of solitary abscess of that organ, and while one occurred in a native of New Orleans, the other seemed to be the sequela of an attack of dysentery in a person who had always lived in a northern climate.

CASE 1. A strong young man of thirty, a sailor, and a native of New Orleans, was brought to the Massachusetts General Hospital, September 12, 1887. About one-half an hour before entrance, while walking in the street, in apparent good health, he was suddenly seized with a very sharp and severe pain in the right side of his chest, which made a deep inspiration, a cough or even the slightest motion almost impossible. His respirations were shallow and rapid, about fifty in the minute. He had had no previous cough, but now had a strong desire to cough, which the pain inhibited. His pulse was 100 and of good character. The heart was not displaced.

Subsequent questioning disclosed the fact that for two months previously he had had occasional slight pains in the right side; never of long duration nor severe enough to lead him to give up his work.

Two days after entrance, an examination made by Dr. F. C. Shattuck showed dulness over the right lower front, in the axillary region and below the angle of the scapula on the same side. There was also deficient resonance over the left lower back. The respiration was feeble over both of these areas of dulness, especially on the right side.

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[1] Read before the Boston Society for Medical Improvement, December 9, 1889.

These cases are reported in connection with papers on Abdominal Surgery, because affections of the liver are especially interesting to abdominal surgeons, and because operations for the relief of liver abscess often have to be made through the peritoneal cavity. Other methods of approach to these abscesses should, therefore, be considered by operators who make the peritoneal cavity their field of work.

This condition of things continued with but little change until the 25th of September, thirteen days after the sudden seizure. At this time Dr. Gannett, who was then in charge of him, introduced an aspirating needle into the right chest through the tenth intercostal space, just behind the posterior axillary line, and drew out twenty-five ounces of a thick, stringy reddish-brown fluid. A microscopical examination of this showed degenerated pus and blood cells, small fat drops and granular matter insoluble in acetic acid. It also contained hæmatoidin and bilirubin crystals. With acetic acid, the fluid gave a very marked mucin reaction.

I now saw the patient in consultation, and as all concurred in the diagnosis of an abscess of the liver which had broken into the pleural cavity, he was transferred to the surgical wards for operation.

October 1, 1887, ether was administered and an opening made into the chest just in front of the point where the aspirating needle had drawn fluid. Two quarts of fluid similar to that drawn by aspiration, were removed, and through the opening the finger passed into a ragged cavity below the diaphragm, which communicated by a large opening with the general chest cavity.

Two good-sized drainage-tubes were introduced, the cavity was washed out, and an antiseptic dressing was applied.

The patient's recovery was steady and uneventful. He went out to the Convalescent Home on November 7th, just a month after the operation. At this time he was still wearing a tube, which was soon, however, removed and the wound closed.

Case II. The patient was a strong young German, thirty years old. He had a phthisical family history. He lived in Germany till five or six years ago, when he moved to Boston where he had remained ever since.

In October, 1888, he had an attack of diarrhœa with bloody stools, and he had at this time, for a week, pain in the right hypochondrium and through that shoulder. In June, 1889, he had another similar attack of diarrhœa, which was again soon followed by pain in the hepatic region and through the right shoulder. Soon after this, a swelling appeared in the right hypochondrium, which slowly but steadily increased in size. About the first of September, he was seen by Dr. E. S. Green, who found the hepatic dulness greatly increased in extent, and a bulging swelling extending from the edge of the ribs down into the abdomen as far as the umbilicus. The dulness extended up into the chest as well as down into the belly, and in the axillary line, over the seventh rib and adjoining intercostal spaces was a soft swelling.

Dr. Green aspirated this swelling with a subcutaneous needle, and drew out a little reddish-brown fluid. This he examined microscopically and chemically and found it to contain pus, blood, round epithelial-looking cells stained yellow, fatty degenerated cells, fat drops and hæmatoidin crystals. With acetic acid it gave the reaction for mucin. He made the diagnosis of an abscess of the liver which had extended into the chest, and sent the patient to the hospital where he entered in my wards.

September 7th, I made a free incision in the seventh intercostal space in the axillary line and let out a few ounces of fluid similar to that drawn by the aspiration. Through the opening the finger entered a circumscribed cavity in the lower part of the chest. Pressure over the swelling in the abdomen did not cause any flow of fluid into or through this cavity. The diaphragm could be felt below, strongly bulging upward, and with the finger as a guide, an aspirating needle was introduced through this and reddish pus was withdrawn. Upon the needle as a guide, an incision was made through the diaphragm and a great quantity of pus mixed with coagula escaped. Pressure over the swelling in the abdomen hastened the flow of pus, and the collapse of this tumor showed it to be all one great abscess cavity extending from the umbilicus to above the liver.

Two drainage-tubes were introduced and the patient made an aseptic recovery, the temperature never rising above 99.2° F. One month after the operation he went to the Convalescent Home, still with the tubes in his side, through which a very slight discharge continued. The tubes were finally removed early in November, the discharge having been for some time entirely absent. At this time the liver dulness did not differ materially from the normal.

Perforation of a liver abscess into the pleural cavity is a rather rare occurrence. When it takes place there is usually a precedent pleurisy started by the approach of the inflammation. This may lead to adhesions of the pleural surfaces which may close the greater part of the chest cavity against the penetration of the pus. In the second of the cases reported the pleural cavity had thus protected itself, and the pus, instead of filling the chest, occupied but a small space just above the diaphragm and was already seeking an outlet to the surface through an intercostal space. In the first case, on the other hand, the pleura had not been so successful in shutting itself off by adhesions and the abscess had therefore opened directly into the general cavity and had given rise to diffuse suppurative pleuritis, with a much more serious set of symptoms. Occasionally, the adhesion of the pleural surfaces so completely closes the cavity that the pus finds its way into the lung and may empty through a bronchus.

In both of the cases reported, I was impressed with the ease with which an abscess beneath the diaphragm can be reached through the chest. In the second case, the small opening, which no doubt existed between the cavity below the diaphragm and the chest, could not be found; but with the aspirating needle, the abscess below was explored and then upon the needle as a guide, a free incision was readily made through the diaphragm and good drainage was established. It was our good fortune that the pus was near the outer part of the liver where it could be reached with the finger and drainage-tube.

These cases show the importance of carefully watching the chest with constant physical examinations in cases of suspected liver abscess. Sometimes a serous effusion is the first indication of the approach of an inflammation below the diaphragm to the pleural surface, and its detection may guide us to early surgical interference and enable us to avert the bursting of the abscess in some other dangerous direction,

Thierfelder, in "Ziemssen's Cyclopædia of the Practice of Medicine," says that the operative treatment of abscess of the liver is not promising. The death-rate among the thirty-four cases collected by him was about 33%; and in other earlier statistics it was much higher, in some reaching even 80%. These statistics include also cases in which the operation was done through the peritoneal cavity, among which the mortality in those days was very high.

In regard to the cases in which the pleura is invaded, he says, "After perforation into the pleura, if the strength of the patient is not already too far reduced, the operation for empyema is indicated, which when undertaken as early as possible may possibly lead, on the whole, more frequently to a favorable issue than would be expected in view of previous experience." This is the doubtful opinion of one who derived his experience from pre-antiseptic times.

At present, with modern methods, the mortality is very much reduced, and operations, even when the peritoneal cavity is entered, have a good measure of success. It is well to bear in mind, however, that the lower segment of the chest cavity is in the closest relations to the liver, and offers, in appropriate cases, a safer approach to the abscess cavity than can be obtained through the peritoneum.

A CASE OF RELAPSING APPENDICITIS IN WHICH THE APPENDIX WAS REMOVED IN AN INTERVAL BETWEEN THE ATTACKS; WITH RECOVERY.[1]

THE patient was a young and vigorous man of twenty-five. He was first seen by the writer on October 29, 1890. He had had a slight attack of pain in the right iliac region about a year before, which had lasted but a few hours, and the nature of which was not made out at the time. In the nine months that immediately preceded his visit to me, he had had three attacks of pain in the same region, severe in character, and lasting, in each instance, several days.

As the early history of these cases is of great importance I will quote at length the notes of the first two of these attacks, as taken at the time by Dr. C. V. Bemis, who took care of him during them, and to whom I am indebted for the very accurate account of the condition of things observed by him.

January 19, 1890, Dr. Bemis was called, and found the patient suffering great pain in the abdomen, localized mainly in the right iliac region. A tumor about half the size of the fist was readily detected in this region, and it was very sensitive to pressure. He had nausea and vomiting, and the pulse and temperature were moderately elevated. Rectal enemata were followed by large and repeated fæcal discharges, and the pain lessened after several moderate doses of morphine had been given. From the first he made steady improvement, and on the sixth day he was so well that the doctor's visits were discontinued.

May 9, 1890, Dr. Bemis was again summoned to him in another attack of pain in the same region. Again there was vomiting and a good deal of tenderness in the cœcal region. This sensitiveness was not so localized as before, and there was no swelling to be detected.

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[1] Read before the Boston Society for Medical Improvement, November 24, 1890.

Enemata were again given, with but small result. Small doses of morphine controlled the pain, and on the following day he was quite comfortable. During this attack the urine was found to contain a considerable amount of uric acid, giving rise to the suspicion that the pain might be of a rheumatic character.

On October 20, he had the third attack of excruciating pain, again in the right iliac region. He was at the time travelling in the West, and had to take a hundred mile ride in the cars, to reach Detroit where he could get accommodations in a hospital. During this trip his sufferings were almost intolerable; but after he reached the hospital and had proper treatment, he again rapidly recovered, and was well enough in eight days to stand the journey East. The doctors in Detroit made a diagnosis of appendicitis, and advised the removal of the appendix in an interval between the attacks.

Immediately upon his arrival in Boston he consulted me at the Massachusetts General Hospital in regard to the advisability of an operation for the removal of the appendix during the intermission. He was entirely free from any pain whatsoever, his bowels were regular, and, in short, he was entirely over his last attack.

Examination of the abdomen showed that it was soft, and easily examined. There was no tenderness in the right iliac region, and by deep palpation there I could feel a little elongated mass which rolled under the finger. As it slipped to-and-fro under pressure the patient said, "there, if there is any tender place, it is where you are pressing now."

The recurrence of the attacks and their character made it seem probable that we had here a case of catarrhal appendicitis, and it seemed highly probable that the disease would continue to appear at intervals, with the possibility that an ulceration might at any time lead to perforation of the appendix with consequent peritonitis.

The patient's occupation, which was that of a wool buyer, obliged him to spend much of his time travelling about in wild parts of the country, often far from the beaten track, in regions where a skilful surgeon could not be had.

The risk of the operation had, therefore, to be balanced against the possibility of serious results if he had an attack, with perforation, when in some inaccessible region away from surgical help. The nature of these risks was thoroughly explained to him and his friends, and after considering the question carefully, they decided in favor of an operation.

This was accordingly undertaken on November 3, 1890. After the ordinary preparation for an abdominal operation, he was etherized, and an incision about three inches long was made in the linea semilunaris on the right side, the centre of the incision being over the point where the appendix had been felt. The cœcum was readily found, drawn out, and below its lower end the appendix was found strongly bent backward, and curved below the caput cœci, to which it was attached by a short meso-appendix. This was tied in sections and cut off, until the appendix had been freed down to its junction with the cœcum. It was then tied with fine but strong silk. The serous coat was cleared by a circular incision some little distance in front of the ligature. It was then peeled back like a cuff for some distance, and the appendix, that is, the muscular and mucous coats, were divided at a point much nearer the ligature. The serous coat was then brought over the end by sutures applied in the Lembert fashion, drawing the serous surfaces together in the manner employed to close the end of the intestine where it is cut squarely across.

Recovery after the operation was without incident. The patient sat up on the eleventh day, and went home on the sixteenth day perfectly well. At that time the examination of the right iliac region showed no tenderness nor fulness.

The examination of the appendix after removal showed it to be somewhat enlarged, with thickened walls. A careful microscopic examination of it was made by Dr. William F. Whitney, who reported that the thickening and stiffness of the walls was due largely to an infiltration of the several coats of the appendix with small round cells. Cross-sections showed the mucous membrane over a large part of the appendix to have been removed by ulceration, so that the epithelial surface was only retained in islands here and there.

The most important question in regard to these cases is when to operate. The decision of this question must be made in each case for itself. The case reported above is an example of a condition of things which must sometimes occur; where the reasons for the operation depend largely upon the occupation of the patient. One would not think of operating on a patient who had had but three attacks of moderate severity and not accompanied by peritonitis, if the patient were living in or near a large city where he could be constantly under the eye of his surgeon; but if, as in the above case, the patient is for a large part of his time so situated that he cannot get skilled medical attendance, it may often happen that the risks of the disease are greater than the risks of the operation.

FIFTY-TWO CASES OF LAPAROTOMY UNDERTAKEN FOR THE REMOVAL OF TUMORS.[1]

In the following tables are comprised all of the laparotomies done by the writer for the removal of tumors. No case was refused on account of the severity of the operation, or the feeble condition of the patient. Suppurating cysts, so fixed that they could not be removed, cases of pyo-salpinx, or ruptured tubal pregnancy, and of the removal of ovaries for the cure of insanity, are not included in this collection of cases.

Most of these patients were operated upon in the Massachusetts General Hospital. The operations prior to 1889 were done in the public amphitheatre, and were afterwards treated in close proximity to other cases, sometimes in the open wards.

After 1889 the new abdominal ward was opened, and all subsequent operations, in the Hospital, were done in it.

The patients were cared for by the house-surgeons in charge of the other surgical cases.

There has been a prejudice against doing abdominal operations in the midst of other surgical patients. Tait says that these patients should never be operated upon in general hospitals. These results would go to show that the dangers are not so great as have been supposed, or rather they illustrate the improved sanitary condition of our hospitals under the antiseptic regime. It may be interesting to consisider the precautions taken in these cases to protect them from infection.

ANTISEPTIC PRECAUTIONS.

The operations were done, as a rule, in the early part of the day, before the room had been used for other cases.

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[1] The first twenty-five of these cases were reported at length in the Boston Med. and Surgical Journal, Jan. 10th, 1889.

In the first four ovariotomies the operation was done under carbolic spray. In none of the other cases was this employed.

The instruments were prepared by boiling or baking, and afterwards by immersion in a carbolic solution. So far as possible the instruments used in other operations were avoided.

The sponges were specially prepared, and in all the later cases the wool sponges described by Dr. Elliot were used. These were boiled, then soaked in bichloride solution, 1 : 1000, and were never used a second time, so that they were always fresh.

The hands of the surgeons and assistants, and the abdomen of the patient, were scrubbed with soap and water, and then with bichloride solution, 1 : 2000.

No irrigation with antiseptic solutions was used on account of the fear of toxic effects from the absorption of portions of the solution that might be retained; but, as will be shown later, irrigation with hot water was used in many of the cases.

The dressings in the earlier cases consisted in a little piece of iodo form gauze laid along the line of incision, and outside of this some loose crumpled, carbolic gauze, covered with a large pad of absorbent cotton. In the later cases iodoform was given up on account of its toxic effects, and powdered boric acid was used in its place, being applied as a dry powder along the line of incision. The whole dressing was held in place by a flannel swathe.

The particulars of the operations seem for the most part to be sufficiently explained in the table. It may be of value, however, to examine a little more carefully the causes of death in the cases that resulted fatally, and to mention one or two exceptional conditions which were met with.

THE FATAL CASES.

There was but one case in which death resulted from a completed ovariotomy. This case, No. 26 in the table, was that of a feeble old lady of 57, who looked considerably older. The kidneys were not acting very well before the operation, but still the secretion of urine was sufficient. The operation was a comparatively easy one, the tumors which affected both ovaries were quickly removed, and the operation was soon finished. The kidneys, however, never established their function after the patient came out of her ether. Evidently, there was congestion of them with complete suppression of urine. Possibly, in this case, if an effort had been made before the operation to increase the quantity of urine by the administration of large quantities of water, the result might have been different.

In one later case, a similar imperfect action of the kidneys was met with, and by exhibiting large quantities of water before the operation the action of the kidneys was so thoroughly established that the operation was perfectly well borne, and the patient made a good recovery.

While this was the only case in which the fatal result followed directly upon the operation, there was one other case, No. 17, in which death resulted from nephrectomy done for the relief of a urinary fistula, which followed the operation for the removal of a cyst.

There were no deaths among the fibroid operations. One death followed an exploratory incision.

In this case the patient was seen for the first time just before the operation. The family were anxious that any desperate chance should be taken, and although the case was regarded as extremely unfavorable, and the result more than doubtful, it was consented to make a quick exploratory operation with the intention of removing the cyst if it could be rapidly peeled out. Immediately upon opening the peritoneum it was evident that such would not be the case, the cyst being universally adherent, and having many solid parts in it. It was therefore at once determined to close the abdomen, and while this was being done, the patient, whose stomach was very much pressed upon by the tumor, regurgitated a large amount of liquid food into the throat, strangled, and in spite of every effort to resuscitate her by artificial respiration died on the table.

MULTILOCULAR FIBRO CYST OF THE UTERUS.

There was one rather unusual instance of a fibro cyst of the uterus. The patient was a feeble woman of 35. The cyst had been noticed for nine months. It distended the abdomen pretty evenly, and had so lax a wall that it had been doubted whether the condition was not one of ascites rather than a cyst. It was quite adherent, and after the adhesions were separated it came easily out through the incision, and was then found to be attached only to the fundus of the uterus, about midway between the fallopian tubes. It had quite a long pedicle, one that was easily clamped and tied. The patient, owing to her feeble condition, made a rather slow but steady recovery. There was no evidence that the cyst had originated in either of the ovaries.

IRRIGATION.

A word in regard to the irrigation of the peritoneal cavity may not be out of place, for the value of it is just becoming understood,[1] and I think there is no other procedure recently introduced into the technique of laparotomy to which in so large measure is due the present success of the operation. In the cases reported there were several instances in which pus escaped freely through the abdomen. In two of the cases this pus was very fetid. It can easily be imagined what increased danger of peritonitis there is in such accidents, and how important the thorough cleansing of all the intricate pockets and pouches of the peritoneum becomes under these circumstances. In no way can this cleansing be accomplished so completely, and with so little irritation to the intestines, as by irrigation with a stream of water. Formerly it was thought that the water must be boiled or mixed with some antiseptic to avoid the danger of introducing micro-organisms into the abdomen. The experience of Mr. Tait and others has shown that these precautions are unnecessary, and that plain water drawn directly from the faucet may safely be used in this way. This fact is so at variance with other experience in antiseptic surgery, that much special investigation has been directed to the explanation of this discrepancy.

Wegner has shown by experiments that the peritoneum has an extraordinary power of absorbing fluids. By introducing air and fluids together, he found that so long as he did not put in more than fifteen cubic centimetres of a putrescible fluid, this was absorbed before the bacteria in the air had any opportunity to propagate in it. When, however, the amount of the fluid approached fifty cubic centimetres, portions of this remained not absorbed long enough for the bacterial growth to commence in it, and to set up decomposition.

Grawitz repeated and confirmed these experiments of Wegner's, and found that large numbers of saprophytic bacteria could be disposed of by the peritoneum, if it did not at the same time contain considerable putrescible fluid. If pyogenic organisms were introduced in small quantities, and mixed with only so much fluid as could be easily absorbed, they were quickly destroyed and did no harm, provided that the peritoneum was in a normal condition.

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[1] This was written in 1888.

When a very large quantity of these pyogenic organisms were introduced, or when they were associated with so much fluid that the peritoneum could not quickly dispose of it, they gave rise to peritonitis, even when the peritoneum was previously in a normal condition.

If, on the other hand, the peritoneum was already inflamed, or if there was an extensive wounded surface in it, or if it contained a blood-clot or serum in which the organisms could propagate, they were then capable of setting up peritonitis even when introduced in small numbers.

Mr. Cheyne, in the Hunterian lectures for 1888, sums up the facts as follows: "In order to develop peritonitis, the cocci must either be introduced in such numbers, along with their products, that a part of the peritoneum is at once injured, and thus ceases to exercise its normal functions, or they must be introduced into an unhealthy peritoneum, or they must be able to grow in the peritoneal cavity, either because fluid is present in too large a quantity to be quickly absorbed, or because the absorptive power of the peritoneum has been diminished, or because some material, such as a piece of blood-clot, or a piece of injured or dead tissue, is present, in which they can develop."

It is plain, therefore, from these experimental researches, that although the peritoneum is much more tolerant of micro-organisms than was at first believed, still under certain circumstances they may do great harm. It is further evident that by properly understanding the conditions which favor septic trouble we may greatly assist the peritoneum to safely dispose of such germs as find their way into it.

In the first place, the septic organisms which enter the abdomen must be reduced to a minimum, and, secondly, the blood-clots, cyst fluid, and serum which might afford appropriate soil for their development must be thoroughly removed.

All this is best accomplished by thorough irrigation, which washes out the pus and contained germs, that may have escaped from cyst or tube, and at the same time removes the clots and serous fluids.

When extensive wounded surfaces are left in the pelvis, from which an exudation of serum is likely to occur, a drainage tube should be left in to conduct away this serum.

But, it may be said, this serum will be absorbed by the peritoneum, according to the showing of the experiments. That is true, immediately after the operation, but presently the peritoneum around these wounded places glues together and shuts this exuding surface out from the general peritoneal cavity, thus taking away that opportunity for absorption, and then if the serum continues to collect you presently have an abscess to evacuate, as was very well shown in Case 8.

Lastly, in regard to the best way of applying irrigation:—In June, 1888, I saw Mr. Bantock wash out the peritoneum in the manner employed, I believe, by Mr. Tait. He had a good-sized Tait's blunt trocar attached to a large rubber tube, which, acting as a syphon, drew the water from a pitcher held high above the patient. With the trocar he was then able to carry the stream down into the pelvis or to any part of the peritoneal cavity, and the water rushing in behind the intestines washed everything out forwards. The procedure, whether original with himself or Mr. Tait, was very thorough, and I have since used it with good success in those of my cases requiring irrigation.

IODOFORM POISONING.

Among these patients there occurred two instances of rather severe symptoms from the absorption of iodoform.

In the first case, No. 4, a very small quantity of iodoform powder was sprinkled along the line of incision, after it had been closely sutured, so that none of the powder came in contact with the wounded surface. Outside of this the wound was covered with dry gauze. This patient came out of the ether well, but was troubled with persistent vomiting. Almost everything taken into the stomach was soon rejected. The vomited matters were dark in color and extremly acrid, so much so that they made the tongue raw, and produced an excoriated line where they ran down over the chin. Little was thought of this at first, as the patient said that she had always been troubled with a bad stomach, and often had such attacks of vomiting. On the fourth day the urine was scanty, only eleven ounces in the twenty-four hours, and an examination of it was made. On adding nitric acid for the albumen test, a black line of iodine was developed between the acid and the urine. The iodoform was at once suspected as the cause of the vomiting, and the dressing was changed. Almost no yellow color remained about the wound, which had united by first intention. The skin was carefully washed and a dry gauze dressing was replaced. From this time the vomiting steadily abated. She now retained a Seidlitz powder and had a movement of the bowels. The quantity of urine increased until it reached the normal amount, and the patient made a good recovery.

In the second case, No. 12, somewhat more iodoform was used about the wound, as a glass drainage-tube was left in the pelvis, and the end of this, projecting above the skin, was wrapped in iodoform gauze. This patient recovered well from the ether, with but little nausea. The next day she was perfectly comfortable, but towards night began to vomit. When I saw her the next day at noon she was constantly vomiting a dark fluid, which had blistered and excoriated the skin of her lips and cheek. The urine was at once examined and a considerable quantity of free iodine was found in it. The dressing was at once changed, all iodoform was removed, and powdered boric acid was used in its place. At the same time a saline cathartic was administered. Two hours later the vomiting stopped and did not recur.

The characteristic symptom of these two cases was the constant vomiting or rather regurgitation of an extremely irritating fluid. Unfortunately the vomitus was not examined for iodine. In both patients, an immediate improvement followed the removal of the iodoform and the administration of a saline. In neither case was there any manifest effect on the sensorium.

It is interesting to see that a poisonous amount of iodoform can be absorbed from an almost unbroken skin surface. The absorption was no doubt favored, as Dr. E. G. Cutler has shown that it may be, by the pressure of the dressing and the moisture about the wound.

COMPLETED OVARIOTOMIES.

No.	Date of Operation.	Age.	M. or S.	No. of Children.	No. of Tappings.	Time since First Noticed.	Size and Nature of Tumor.	One or Both Ovaries.	Adhesions.	Treatment of Pedicle.	Drainage or Not.	Hospital or Private.	Result.	Remarks.
1	Mar. 1884.	50	S.			4 years.	Multilocular Cyst, 18 lbs.	Both.	To abdominal wall and rectum.	Tied and burnt.	No.	P. H.	Recovery.	Well four years later.
2	Apr. 1884.	24	S.		1	4 or 5 years.	Parovarian with cystic ovaries.	"	None.	"	"	"	"	Seen in good health about year later.
3	Jan. 1885.	32	M.			3 years.	Unilocular.	One	Omental.	"	"	"	"	Seen in good health a yr. later
4	June, 1886.	45	W.	1		2 years.	Multilocular cyst.	"	Slight in Pelvis.	"	"	"	"	Iodoform symptoms. In goo health a year later.
5	Jan. 1887.	25	S.			2 years.	Small sloughing ovarian cyst.	"	None.	"	"	H.	"	Sloughing due to pressure fibroid on pedicle.
6	July, 1887.	46	M.	3		18 months.	Unilocular cyst size of cocoanut.	"	"	Tied.	"	P.	"	
7	Aug. 1887.	27	S.			3 months.	Small dermoid cyst and pyosalpinx.	Both.	Universal.	Tied and burnt.	Yes.	H.	"	Fæcal fistula appeared 4 week after operation. Closed end of a year.
8	Aug. 1887.	32	M.			Symptoms for 5 years.	Small parovarian & hydrosalpinx.	"	"	"	No.	"	"	Pelvic abscess formed, and wa drained through the vagin
9	Sept. 1887.	65	M.	4	2	2 years.	Multilocular ovarian cyst.	One	Slight.	"	"	"	"	
10	Oct. 1887.	35	S.		1	Symptoms for 4 mos.	Papillomatous cyst.	"	Extensive.	"	"	"	"	Recurrence in 9 months.
11	July, 1888.	40	S.			4 weeks.	Suppurating papillomatous cyst.	"	Extensive and firm.	"	Yes.	"	"	Recurrence in 2 months. Io doform symptoms.
12	Aug. 1888.	26	S.	1 mis-car'ge		2 years.	Cystic ovaries with suppurating tubes.	Both.	Universal.	"	"	"	"	Same patient as No. 10. Sup purating parotitis.
13	" "	36	S.			9 months.	Papillomat. cyst.	One.	Extensive.	"	"	"	"	
14	" "	35	M.			Symptoms for 3 mos.	Double suppurating cysts.	Both.	Universal, firm.	"	Yes, 2 tubes.	"	"	
15	" "	33	S.		4	1 year.	Multilocular cyst, 40 lbs.	One.	Extensive, firm to abdominal wall.	"	No.	"	"	
16	" "	31	S.			4 years.	Unilocular.	"	None.	"	"	"	"	
17	Oct. 1888.	22	S.			4½ months.	Suppurating dermoid.	"	Extensive and very firm.	"	"	"	"	Injury of ureter, & [redacted] of a urinary fistula. after a subseq.
18	" "	51	M.	Several.		15 months.	Multilocular, large.	"	None.	"	"	"	"	

19	" "	29	M.	3		3 years.	Multilocular.	"	Extensive and very firm to omentum and bowel.	None found.	"	"	"	
20	" "	29	M.			3 years.	"	"	None.	Tied and burnt.	"	"	"	
21	Nov. 1888.		S.			2 years.	Multilocular suppurating.	"	Universal, very firm.	Tied.	"	P. H.	"	Fæcal fistula appeared on 4 day. Was closed 10th day
22	Feb. 16, '89.	45	M.	2	0	3 or 4 yrs.	Cysto-adenoma.	"	Extensive and firm.	Tied and cut.	Yes.	"	"	
23	July 5, '89.	52	M.	2	1 for ascites.	3 years.	16 lb. cyst.	"	Deep in pelvis.	Tied and burnt.	"	H.	"	Injury of bladder.
24	July 15, '89.	34	M.	5	0	4 years.	Small hemorrhagic cyst.	"	Universal.	"	"	"	"	
25	Sept. 5, '89.	34	S.	0	1 for ascites.	3 months.	Cyst, 3½ lbs.	Both.	Considerable.	"	No.	"	"	
26	Sep. 10, '89.	57	M.	3	7	5 months.	Ovarian cysts.	"	Extensive.	"	Yes.	"	Death.	Suppression of urine from th of operation.
27	Sep. 11, '89.	28	S.	0	0	2 or 3 yrs.	15½ lbs. cyst.	One.	Universal.	"	"	"	Recovery.	
28	Oct. 14, '89.		S.				Sarcoma of ovary.	"	Extensive.	"	No.	"	"	
29	Oct. 30, '89.	52	S.	0		5 weeks.	5½ lb. cyst.	"	None.	"	"	"	"	
30	Nov. 13, '89.	38	M.	2	0	8 weeks.	Cysts adenoma.	"	"	"	"	"	"	Died some months later, cancer of stomach?
31	Jan. 18, '90.	47	M.	0	Two ascites.	6 months.	Solid, nodular and cystic.	"	Extensive.	Tied and burnt.	"	P. H.	"	Appendix vermiformis canc ous and removed. Died cancer 6 mos. later.
32	Feb. 3, '90.		M.	0	0		Small unilocular cyst.	"	None.	Tied and cut.	"	"	"	
33	June 14, '90.	46	S.	0	0	10 years.	Dermoid moderate size.	"	Few.	Tied and burnt.	"	H.	"	
34	July, 1890.	34	M.			12 months.					"	"	"	
35	Aug. 26, '90.	66	M.	0	0	Several years.	Multilocular cyst adenoma 15 lbs.	"	None.	Tied and cut.	"	"	"	
36	Sept. 6, '90.	32	S.	0	0	2½ years.	Dermoid.	"	"	"	"	"	"	
37	Sep. 17, '90.	39	M.	Several.	9	1 year.	Small cystic ovary.		Yes.	"	"	"	"	
38	Oct. 6, '90.	35	M.	2	0	9 months.	Multilocular fibro-cyst of uterus.	" 0	Omental.	Tied.	"	"	"	
39	Oct. 10, '90.	30	M.	0	0	1 year.	Dermoid size of two fists.	One-	No.	Tied and cut.	"	"	"	
40	Oct. 18, '90.	29	M.	2	0	5 months.	Cyst.	"	Many.	"	"	"	"	
41	Oct. 30, '90.	36	M.	1	0	1 year.	Intralig. cyst.	"	Many & firm.	"	Yes.	"	"	
42	Oct. 30, '90.	48	S.	0	0	10 months.	Clear cyst.	"	Few.	"	No.	"	"	
43	Nov. 13, '90.	40	M.	3	0	8 months.	Blood cyst, two pounds.	"	Yes.	Tied and cut.	Yes.	P. H.	"	

Operations for Fibroids.

No.	Date of Operation.	Age.	M. or S.	No. of Children.	Time since first noticed	Size and nature of Tumor.	Treatment of Pedicle.	Hospital or Private.	Result.	Remarks.
1	Sept. 1886.	26	M.	1	1 year.	Subperitoneal fibroid, size of lemon.	Was none.	H.	Recovery.	Tumor shelled out easily from under the peritoneum.
2	Mar. 1887.	25	S.	..	2 years.	Fibroid of body of uterus, filling the pelvis.	Extra-peritoneal with Kœberle's clamp.	H.	Recovery.	Pyelitis caused by pressure on ureter entirely relieved by operation. For full report see Boston Medical and Surgical Journal.
3	Mar. 1890.	27	S.	0	3 months.	Fibroid of fundus, size of fist.	Extra-peritoneal.	H.	Recovery.	
4	Oct. 1890.	35	M.	0	6 months.	Fibroid attached to fundus by small pedicle.	Tied and cut.	H.	Recovery.	

EXPLORATORY OPERATIONS.

No.	DATE OF OPERATION.	AGE.	M. or S.	TIME SINCE FIRST NOTICED.	NATURE OF TUMOR AND COMPLICATIONS.	HOSPITAL or PRIVATE.	RESULT.	REMARKS.
1	Aug. 1886.	51	M.	2 years.	Semi-solid tumor. Secondary nodules on omentum and elsewhere in abdomen.	H.	Recovery.	Died some months later of general cancer.
2	Sept. 1888.	40	S.	2 weeks.	Semi-solid tumor. Disseminated cancer of Peritoneum.	H.	Recovery.	
3	April, 1889.	40	M.	Several months.	Large semi-solid tumor, universally adherent.	P.	Died.	This patient was in a very critical condition. The operation was undertaken as an exploration, in the hope that perhaps the tumor could be shelled out quickly. Nothing could be done, and the patient vomited, strangled and died on the table.
4	Oct. 1890.	28	S.	3 months.	Fibroid of uterus.	H.	Recovery.	The operation was undertaken in the belief that there was a tense cyst, and when it was found to be a soft fibroid that would require a hysterectomy for its removal it was thought better not to so mutilate a woman of her age until the growth of the tumor forced it.
5	Oct. 1890.	31	M.	15 weeks.	Colloid cancer about cœcum.	H.	Recovery.	This tumor was universally adherent and secondary nodules were scattered about the abdomen.

LARGE PAPILLOMATOUS CYST WITH ASCITES; LAPAROTOMY; WOUND OF THE BLADDER WHICH LAY UNUSUALLY HIGH; SUTURE OF IT, WITH COMPLETE RECOVERY.[1, 2]

In June, 1889, I saw Mrs. H. F. H., in consultation with Dr. H. W. Boutwell of Manchester, N. H. The patient was an emaciated woman of fifty-two. Her menses had ceased when she was forty-four, and she had been in apparent good health until one year before my visit, when she noticed that her abdomen was increasing in size. This enlargement was at first more noticed in the right side than in the left. She steadily lost in flesh and strength during the year and the swelling as steadily increased. Six weeks before she came under observation the legs became swollen, and a large protrusion of the vaginal walls became very troublesome. The pressure upward became so great that she suffered greatly from dyspnœa and was unable to lie horizontal.

When seen, the abdomen was enormously distended with ascitic fluid, so that examination by palpation was extremely unsatisfactory.

Nothing could be detected in the heart nor in the condition of the urine to account for this accumulation of fluid, and there was nothing in the symptoms to point to the liver as the seat of trouble. In the absence of evidence in any of these directions, it seemed very probable that an abdominal tumor had given rise to, and was now masked by the ascites. This suspicion was strengthened by the patient's observation that the swelling of the abdomen had started in the right side, and had afterwards become general.

With the object of further observation she was sent to the Massachusetts General Hospital.

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[1] Read before the Boston Society for Medical Improvement, April 28, 1890.

[2] This case is No. 23 in the table of completed ovariotomies.

On June 27, 1889, I tapped the abdomen and drew off sixteen quarts of dark, brownish fluid which contained many blood-cells and some large compound granule cells. After the removal of the fluid, a tumor as large as an adult head came into view, rising up out of the pelvis, and a little to the right of the median line. Portions of this felt elastic, as if cystic in character; but the larger part of it, especially that portion towards the pelvis, was quite firm. It was so fixed in the pelvic region that it altered its position but little on change of position.

A strong suspicion of malignancy was entertained, both on account of the physical qualities of the tumor, and from the character of the fluid removed. It was, however, decided to do an exploratory operation and to remove the tumor if it were found possible.

July 5, 1889. Laparotomy was done. The incision was made midway between the pubes and umbilicus. At a distance of four and a half inches above the upper edge of the pubes, the incision, which was carried straight down through the abdominal wall, opened the bladder, without entering the peritoneum. This opening was closed by an interrupted suture of fine black silk, and then the peritoneum was opened in the upper part of the wound. The tumor, which was very adherent in the pelvis, was peeled out after some difficulty; and there being some persistent oozing of blood from the separated adhesions down in the pelvis, a glass drainage-tube was put in and the abdomen was closed by interrupted silk sutures including the peritoneum.

The tumor was a multilocular cyst, with considerable papillomatous growth in the lower portion. This papilloma had nowhere broken through the cyst wall, nor implicated the peritoneum.

The recovery was uneventful, though somewhat slow on account of the weakness of the patient. The urine was drawn through the catheter for the first week, and some irritability was caused by this frequent catheterization. The bladder suture held perfectly, however, and the wound healed by first intention.

This case was interesting for several reasons: The diagnosis was difficult, as the tumor could not be felt while the ascites was present, and after the fluid was drawn off the character of the tumor and its firm adhesion to the pelvic organs made it seem malignant. This suspicion was strengthened by the bloody character of the surrounding fluid. The result of the operation shows the importance of doing laparotomy in all cases in which there is a possibility of doubt as to the kind of tumor or the feasibility of its safe removal.

The position of the bladder in this case was quite exceptional, and led to its being wounded by an incision at a point where there was no reason for anticipating such a danger.

Usually when the bladder is wounded in laparotomy, the injury passes through the peritoneal surface, and after suturing, the adhesive inflammation of the peritoneum greatly promotes the adhesion of the wound. In this case the incision did not go through the peritoneum, but only involved the connective tissue in front of the bladder. It was like the wound made in suprapubic lithotomy, and in these wounds primary intention is much rarer than in injuries to peritoneal surfaces.

Care was taken in applying the sutures, to include all of the outer layers of the bladder wall, but not to penetrate the mucous membrane.

The accumulation of urine in the bladder was prevented by frequent catheterization, and the ready healing shows that no leakage took place.

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